THE

LONDON, EDINBURGH, AND DUBLIN

PHILOSOPHICAL MAGAZINE

AND

JOURNAL OF SCIENCE.

CONDUCTED BY

SIR OLIVER JOSEPH LODGE, D.Sc., LL.D., F.R.S.
SIR JOSEPH JOHN THOMSON, O.M., M.A., Sc.D., LL.D., F.R.S.
JOHN JOLY, M.A., D.Sc., F.R.S., F.G.S.
ALFRED W. PORTER, D.Sc., F.R.S.

AND

JOHN R. AIREY, M.A., D.Sc., Sc.D.

"Nec aranearum sane textus ideo melior quia ex se fila gignunt, nec noster vilior quia ex allenis libamus ut apes."

JUST. LIPS. *Polit.* lib. i. cap. l. Not.

VOL. XVI.—SEVENTH SERIES.

JULY—DECEMBER 1933.

LONDON:

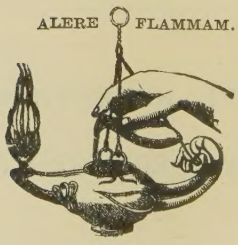
TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

SOLD BY SMITH AND SON, GLASGOW;—HODGES, FIGGIS, AND CO., DUBLIN;—AND VEUVE J. BOYVEAU, PARIS.

" Meditationis est perscrutari occulta ; contemplationis est admirari perspicua . . . . Admiratio generat quæstionem, quæstio investigationem, investigatio inventionem."—*Hugo de S. Victore.*

—— " Cur spirent venti, cur terra dehiscat,
Cur mare turgescat, pelago cur tantus amaror,
Cur caput obscura Phœbus ferrugine condat,
Quid toties diros cogat flagrare cometas,
Quid pariat nubes, veniant cur fulmina cœlo,
Quo micet igne Iris, superos quis conciat orbes
Tam vario motu."

J. B. Pinelli ad Mazonium.



CONTENTS OF VOL. XVI.

(SEVENTH SERIES).

NUMBER CIII.—JULY.

Page

Dr. W. S. Kimball on the Ellipsoidal Viscosity Distribution 1
Dr. E. T. Paris on a Measurement of the Fundamental Sound generated by the Airscrew of an Aeroplane in Flight 50
Dr. E. T. Paris on the Propagation of Sound along the Slipstream of an Airscrew 61
Mr. G. H. Jeffery and Dr. A. I. Vogel on the Electrical Conductivities of Aqueous Solutions of Sodium and Potassium Hydroxides at 25° and the Validity of the "Water Correction" 64
Mr. S. R. Craxford on the Electrocapillary Maximum for a Mercury Electrode in contact with a Solution containing Mercurous Ions. 66
Mr. Chu-Phay Yap on the Influence of Surface Energy in Disperse Systems 80
Mr. R. M. Davies on the Determination of some of the Elastic Constants of Rochelle Salt by a Dynamical Method 97
Messrs. J. A. Ratcliffe and E. L. C. White on the Effect of the Earth's Magnetic Field on the Propagation of Short Wireless Waves 125
Mr. N. S. Boulton on the Temperature Stresses in Walls and Flat Slabs 145
Prof. K. Sezawa on the Vibrations of Turbine Blades with Shrouding 164
Mr. J. G. Baker on the Falling of a Strip of Paper 175
Prof. L. Natanson on Fermat's Principle 178
Dr. S. P. McCallum and Messrs. L. Klatzow and J. E. Keyston on the High Frequency Discharges in Argon.—Part II. 193
Notices respecting New Books:—
Prof. H. W. Turnbull and Dr. A. C. Aitken's An Introduction to the Theory of Canonical Matrices 197
Dr. J. W. Mellor's A Comprehensive Treatise on Inorganic and Theoretical Chemistry.—Vol. XII. 198
Mr. P. Lenard's Great Men of Science 199
Dr. E. L. Ince's Principles of Descriptive Geometry 200

NUMBER CIV.—AUGUST.

Dr. W. J. Duncan and Messrs. D. L. Ellis and C. Scruton on the Flexural Centre and the Centre of Twist of an Elastic Cylinder.. 201
Dr. M. Minnaert on Musical Air-Bubbles and the Sounds of Running Water 235
Dr. B. Bruzs on the Thermodynamic Principle governing Stationary States 248
Mr. B. Prasad on the Viscosity of Fused Salts and Andrade-Sheppard Formula for the Viscosity of Liquids 263
Mr. S. R. Craxford on the Electrophoretic Null-point for Mercury in Aqueous Solutions 268
Mr. I. Koga on the Vibration of Piezoelectric Oscillating Crystal.. 275

Page

Mr. J. S. McPetrie on a Graphical Method for determining the Transit Times of Electrons in a Three-electrode Valve under Conditions of Space-charge Limitation 284
Prof. R. W. Drier and Mr. H. L. Walker on an X-Ray Investigation of the Gold-Rhodium and Silver-Rhodium Alloys 294
The Earl of Berkeley on an Empirical Equation for calculating Osmotic Pressures 298
Mr. I. Backhurst on the Magnitude of the L-Absorption Discontinuities 310
Prof. J. S. Townsend and Mr. E. W. Townsend on Intensity of the Radiation from Uniform Columns in Discharge-Tubes 313
Notices respecting New Books:—
Mr. A. Besicovitch's Almost Periodic Functions 324
Pierre Bricout's Microenergetique 325
Sir James Jeans's The New Background of Science 326
Prof. H. Levy's The Universe of Science 328

NUMBER CV.—AUGUST (SUPPLEMENT).

Mr. W. R. Thomas and Prof. E. J. Evans on the Hall Effect and some other Physical Constants of Alloys.—Part I. The Lead-Bismuth Series of Alloys 329
Prof. J. Kuno on the Relation between Strain and Photo-elastic Effect in Phenolite 353
Drs. F. C. and L. P. Chalklin on some Wave-length Determinations in the very soft X-Ray Region 363
Drs. N. A. V. Piercy and H. F. Winny on the Convection of Heat from Isolated Plates and Cylinders in an Inviscid Stream 390
Dr. A. H. Davis on the Use of Cathode Ray Oscillograph for obtaining Frequency-response Curves 408
Dr. W. N. Bond on the Perfection of Crystal Laminæ 410
Messrs. J. A. Ratcliffe and F. W. G. White on the State of Polarization of Downcoming Wireless Waves of Medium Length 423
Prof. T. M. MacRobert on Proofs of some Formulæ for the Hypergeometric Function 440
Messrs. J. P. T. Viljoen and B. F. J. Schonland on the Distribution of the Ionizing Particles of the Penetrating Radiation in Relation to the Magnetic Meridian 449
Prof. C. G. Barkla and Dr. J. S. Kay on the Determination of the J-discontinuity by a Condition of Matter. (J-Phenomenon.—Part X.) 457
Dr. R. C. Johnson and Mr. E. G. Dunstan on the Intensity Distribution in the Spectrum of Beryllium Oxide 472
Prof. E. A. Owen and Dr. J. Iball on the Thermal Expansion of Zinc by the X-Ray Method 479
Dr. J. J. Manley on Observations concerning Precision Weights .. 489
Dr. E. Tyler on the Instability of Liquid Jets 504
Messrs. M. Benjamin and H. P. Rooksby on Emission from Oxide-coated Cathodes.—II. 519
Notices respecting New Books:—
Mr. W. Hume-Rothery's The Metallic State 525
Mr. E. Grimsehl's A Textbook of Physics 526
E. Bauer's Cinématique de la Relativité 527
F. Perrin's l'Inertie de l'Enérgie 527
G. Darmois's La Théorie Einsteinne de la Gravitation: les vérifications expérimentales 527

Page
E. Cartan's Le parallélisme absolue et la théorie unitaire du champs 527
P. Langevin's La Relativité : Conclusion générale 527
Prof. A. Einstein's Fondements de la Théorie de la Relativité générale.—Gravitation et Electricité.—Structure cosmologique de l'espace 528

NUMBER CVI.—SEPTEMBER.

Dr. J. W. Campbell on the Clock Problem in Relativity. (Second Paper.) 529
Mr. J. S. McPetrie on the Determination of the Interelectrode Times of Transit of Electrons in Triode Valves with Positive Grid Potentials 544
Prof. A. Miyadzu on the Path and Stability of a Local Vortex moving round a Corner 553
Dr. A. E. Bate on Resonance in Coupled Pipes 562
Mr. C. G. Pendse : Note on the Stability of Saturn's Rings 575
Mr. M. A. Azim, Dr. S. S. Bhatnagar, and Prof. R. N. Mathur on the Influence of Temperature on the Diamagnetism of certain Liquids 580
Dr. H. Mayer on the Radiation of Metal Surfaces bombarded by Positive Alkali Ions 594
Prof. E. A. Owen and Mr. E. L. Yates on Crystal Parameters of Four Metals when under Reduced Pressure 606
Prof. A. Larmor on the Explanation of the Fitzgerald Contraction in Optics 610
Mr. I. G. Walters on some Electrocapillary Experiments 617
Mr. J. E. Keyston on the Intensities of the Spectra emitted by High-Frequency Discharges in Helium 625
Dr. M. Prasad on an X-Ray Investigation of Crystals of Stilbene and Tolane 639
Dr. J. Small on the Thermal Aspects of Carburation, with special reference to the Vaporization of Ethyl Alcohol 641
Dr. L. F. Bates on a Correlation of some Thermoelectric and Thermomagnetic Data 657
Dr. A. L. Reimann on the Clean-up of Hydrogen by Magnesium .. 673
Mr. G. W. Brindley and Dr. F. W. Spiers on Experiments on the Photographic Effect of X-Rays 686
Mr. W. J. Rees and Dr. L. H. Clark on the Scattering of Gamma-Rays in Air and Water 691
Messrs. R. Roscoe and P. J. Hutchings on a Rapid Method of Determining the Crystal Axes of Single Crystal Wires of certain Metals 703
Dr. W. H. McCrea on the Interpretation of Einstein's Unified Field Theory 707
Mr. W. A. Wood on the Lattice Distortion in Nitrided Steels and Theory of Hardness 719
Notices respecting New Books :—
Mr. T. M. Macrobert's Functions of a Complex Variable. (2nd Edition.) 728
E. Schrödinger's Mémoires sur la Mécanique Ondulatoire 728

NUMBER CVII.—OCTOBER.

Page

Prof. J. S. Townsend on the Distribution of Energies of Electrons in Gases 729
Mr. H. J. Allcock on the Mathematical Transformation of the Set-square-index Nomogram 744
Mr. J. A. Darbyshire on the Inner Potential of Metals 761
Mr. J. Back: Note on the Gold-leaf Electroscope 775
Mr. D. A. Richards on the Electron Diffraction Patterns from Platinized Asbestos. (Abridged Thesis approved for the Degree of M.Sc. by the University of London.) 778
Dr. A. H. Davis on the Acoustical Theory of Exhaust Silencers of the Perforated Baffle Type 787
Prof. E. Taylor Jones on the Structure of Thin Celluloid Films.—I. 793
Sir J. J. Thomson on Models of the Electric Field and of the Photon 809
Mr. A. C. Bartlett on the Calculation of Modulation Products.... 845
Notices respecting New Books:—
Actualités Scientifiques et Industrielles. Nos. 35, 36, 37, 46, 60, 64 848

NUMBER CVIII.—NOVEMBER.

Messrs. S. R. Craxford, O. Gatty, and J. St. L. Philpot on the Theory of Electrocapillarity.—Part I. Capillarity 849
Mr. W. McFarlane on Induction Coil Discharges 865
Mr. R. J. Cornish on the Turbulent Flow through Fine Eccentric Clearances 897
Dr. H. O'Neill and Messrs. J. F. B. Jackson and G. S. Farnham on a Critical Study of the Hardness Behaviour of Duralumin .. 913
Mr. C. Gilbert on the Energy Levels of the Hydrogen Molecular Ion 929
Dr. R. A. Houstoun on a New Method of Colorimetry 945
Prof. E. Taylor Jones on the Structure of Thin Celluloid Films.—II. 953
Messrs. J. A. Darbyshire and K. R. Dixit on Nature of Polish Layers 961
Prof. B. Sen on the Uniqueness of Solution of Problems of Elasticity connected with the bending of Thin Plates under Normal Pressures 975
Mr. K. R. Dixit on the Inner Potential of Semi-Conductors 980
Mr. A. M. Crooker on Paschen Back Effects in the Spectra of Thallium 994
Mr. J. F. Allen on the Supraconductivity of Alloy Systems..... 1005
Notices respecting New Books:—
Sir Arthur Eddington's The Expanding Universe 1044
Miss Margaret Fishenden and Mr. Owen A. Saunders's The Calculation of Heat Transmission 1045
Messrs. G. P. Harnwell and J. J. Livingwood's Experimental Atomic Physics 1045
Louis Leprince Ringuet's Les Transmutations Artificielles ... 1046
L. Brillouin's Notions de Mécanique Ondulatoire; les méthodes d'approximation 1046
Hans Reichenbeck's Atom and Cosmos 1046
G. Fournier and M Guillot's Sur l'absorption exponentielle des rayons beta du Radium E 1047
Dr. E. A. Moelwyn-Hughes's The Kinetics of Reactions in Solution 1047
Mr. Grimsehl's A Textbook of Physics.—Vol. III. Electricity and Magnetism 1048

NUMBER CIX.—DECEMBER.

Page

Mr. K. R. Dixit on an Investigation of the Orientations of Thin Evaporated Metallic Films by the Method of Electron Diffraction 1049

Prof. H. S. Carslaw and Mr. R. J. Lyons on a Trigonometrical Sum. 1065

Dr. K. G. Emeléus and Mr. A. H. Gregg on the Association of Ionic Oscillations with the Negative Glow and Anode Glow ... 1079

Mr. P. A. Mainstone on the Effect of Heat Treatment on the Production of Frictional Electric Charges on Metals 1083

Prof. K. C. Kar and Mr. A. Ganguli on the Wave-Statistical Theory of Radioactive Disintegration 1097

Prof. F. H. Newman on a Sodium Glow-lamp 1109

Mr. B. C. Sil on the Variation of the Inter-electrode Capacity of a Triode at High Frequencies 1114

Mr. E. H. Bateman on the Strain Energy of an Elastic Bar: a useful Transformation 1128

Dr. E. W. Pollard on the Heights of Nuclear Potential Barriers.. 1131

Prof. C. D. Child on the Quenching of Light from Flames produced by Various Chemicals..... 1141

Notices respecting New Books:—

Actualités Scientifiques et Industrielles. Nos. 42, 49, 50, 51 58, 59, 63, 68..... 1150

Index 1153

PLATES.

I. Illustrative of Dr. E. T. Paris's Paper on a Measurement of the Fundamental Sound generated by the Airscrew of an Aeroplane in Flight.

II.–IV. Illustrative of Messrs. J. A. Ratcliffe and E. L. C. White's Paper on the Effect of the Earth's Magnetic Field on the Propagation of Short Wireless Waves.

V. Illustrative of Dr. S. P. McCallum and Messrs. L. Klatzow and J. E. Keyston's Paper on High Frequency Discharges in Argon.—Part II. Spectral Properties.

VI. & VII. Illustrative of Dr. F. C. Chalklin and Dr. L. P. Chalklin's Paper on some Wave-length Determinations in the very soft X-Ray Region.

VIII. Illustrative of Dr. A. H. Davis's Paper on the Use of Cathode Ray Oscillograph for obtaining Frequency-response Curves.

IX. Illustrative of Dr. W. N. Bond's Paper on the Perfection of Crystal Laminæ.

X. Illustrative of Dr. R. C. Johnson and Mr. E. G. Dunstan's Paper on Intensity Distribution in the Spectrum of Beryllium Oxide.

XI.–XIII. Illustrative of Dr. E. Tyler's Paper on the Instability of Liquid Jets.

XIV. Illustrative of Messrs. M. Benjamin and H. P. Rooksby's Paper on Emission from Oxide-coated Cathodes.

XV. & XVI. Illustrative of Prof. E. A. Owen and Mr. E. L. Yates's Paper on Crystal Parameters of Four Metals when under Reduced Pressure.

XVII. Illustrative of Messrs. R. Roscoe and P. J. Hutchings's Paper on a Rapid Method of Determining the Crystal Axes of Single Crystal Wires of certain Metals.

XVIII. Illustrative of Mr. W. A. Wood's Paper on Lattice Distortion in Nitrided Steels and Theory of Hardness.

XIX. Illustrative of Mr. James A. Darbyshire's Paper on Inner Potential of Metals.

XX.–XXII. Illustrative of Mr. D. A. Richards's Paper on Electron Diffraction Patterns from Platinized Asbestos.

XXIII. Illustrative of Prof. E. Taylor Jones's Paper on the Structure of Thin Celluloid Films.

XXIV.–XXVII. Illustrative of Mr. Walter McFarlane's Paper on Induction Coil Discharges.

XXVIII. Illustrative of Dr. Hugh O'Neill and Messrs. J. F. B. Jackson and G. S. Farnham's Paper on a Critical Study of the Hardness Behaviour of Duralumin.

XXIX. Illustrative of Prof. E. Taylor Jones's Paper on the Structure of Thin Celluloid Films.—II.

XXX. Illustrative of Messrs. J. A. Darbyshire and K. R. Dixit's Paper on Nature of Polish Layers.

XXXI. & XXXII. Illustrative of Mr. K. R. Dixit's Paper on the Inner Potential of Semi-Conductors.

XXXIII. Illustrative of Mr. K. R. Dixit's Paper on Investigation of the Orientations of Thin Evaporated Metallic Films by the Method of Electron Diffraction.

XXXIV. & XXXV. Illustrative of Prof. F. H. Newman's Paper on a Sodium Glow-lamp.